

SONOBUOY SEISMIC DATA COLLECTED DURING 1982 IN THE BERING SEA

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In July-August 1982, the U.S. Geological Survey participated in a government-industry cooperative project for reflection/refraction profiling (GICORP), co-directed by the Center for Marine Crustal Studies, Gulf Oil Corporation. During the cruise (L9-82-BS) aboard the U.S.G.S. research vessel S.P.Lee, 53 seismic sonobuoy profiles, as well as other seismic and geopotential data, were recorded over the Bering Sea continental shelf and abyssal Aleutian basin. This report includes microfilm copies of the sonobuoy seismic monitor records, logsheets, and navigation collected during the cruise. Sonobuoy data have also been recorded on magnetic tape.

The seismic sonobuoy data from the Bering Sea (Figure 1) were recorded using a 5-airgun source array with air displacement that varied from 1311 to 2300 in³ (Table 1). Two types of sonobuoys were used, military (U.S.Navy-type 41B) and commercial (Ref Tek 1-type 176 mhz). Detailed procedures for the shipboard recording and display of the sonobuoy data are described in Childs and Cooper(1978). Briefly, the sonobuoys were deployed with hydrophone depths of 60-65 feet and were recorded on ship on both analog magnetic tape and paper monitor records. Data displayed on the monitor records were read from the analog magnetic tapes, rather than directly from the sonobuoy receiver, to verify that good sonobuoy data were being recorded on the magnetic tape. Later, the sonobuoy tapes were replayed with variable bandpass filter settings and different vertical time scales to produce additional paper monitor records. The microfilm includes two monitor records for each sonobuoy profile, a 10-second record that was generated during the actual sonobuoy run (useful for reflection/ refraction velocity determinations) and a 32-second record that was replayed from the magnetic tape (useful for monitoring the direct arrival and refraction arrivals). For two sonobuoy stations (242 and 243), the same procedures were followed and sonobuoy data were also recorded digitally on a shipboard multichannel seismic recording system.

Shipboard navigation was done by computer with inputs from TRANSIT satellite, Loran C-hyperbolic, Loran C-rho rho, gyro, and a water speed indicator. Firing of the airgun array was controlled by the navigation system and was done on either a time basis (17 to 22 seconds) or a distance basis (50m or 100m). Multichannel seismic-reflection, high resolution seismic-reflection, gravity, magnetic, and bathymetry data were recorded simultaneously with the sonobuoy seismic data.

Two points concerning the sonobuoy operations are noteworthy:

1. Sonobuoys recorded in the St. George Basin (buoys 192 to 197), Bristol Basin (buoys 198 to 205), and Navarin Basin (buoys 225-228 and 233-241) areas often have high seismic noise levels caused by other seismic boats operating nearby. Consequently, the data in these areas are degraded and reflectors/refractors are more difficult to identify.
2. On many sonobuoy profiles, especially those recorded in very shallow water (25-40 m), the direct arrival (ship to buoy through the water) is noticeably curved, rather than being straight, at large offsets (20-40 km). Because the direct arrival is curved and the refraction arrival at similar offsets is usually not curved, ship speed changes or buoy drift do not appear to be the explanation for the curved direct arrival. The explanation is unclear but may be related to velocity variations in the water column along the sonobuoy profile. Surface-water temperatures have been measured for each sonobuoy (see logsheets), however these temperatures are uniform and do not suggest variations in the surface-water velocity.

Seismic sonobuoy data from the GICORP project are slated for digital processing at the Center for Marine Crustal Studies, Gulf Oil Corporation. Analog magnetic tapes will be converted to digital tapes and processing done from the digital tapes. Full size copies of seismic sonobuoy monitor records are available for inspection at USGS, 3475 Deer Creek Road, Rm B112, Palo Alto, California. For information concerning the inspection of these records and the availability of the analog and digital (available when converted) tapes contact:

Dr. Alan Cooper
U.S. Geological Survey, MS 99
345 Middlefield Road
Menlo Park, Ca. 94040
415-856-7094

Copies of the microfilm data and digital navigation data are available from:

Dr. Michael Loughridge
Chief, Marine Geology and Geophysics Division
National Geophysical and Solar-Terrestrial Data Center
NOAA/EDIS/NGSDC, Code D64
325 Broadway
Boulder, Colorado 80303
303-497-6338

1

REFERENCES:

Childs, J.R., and Cooper, A.K., 1978, Collection, reduction, and interpretation of marine seismic sonobuoy data, U.S. Geol. Survey Open-File Report 78-442, 219 p.

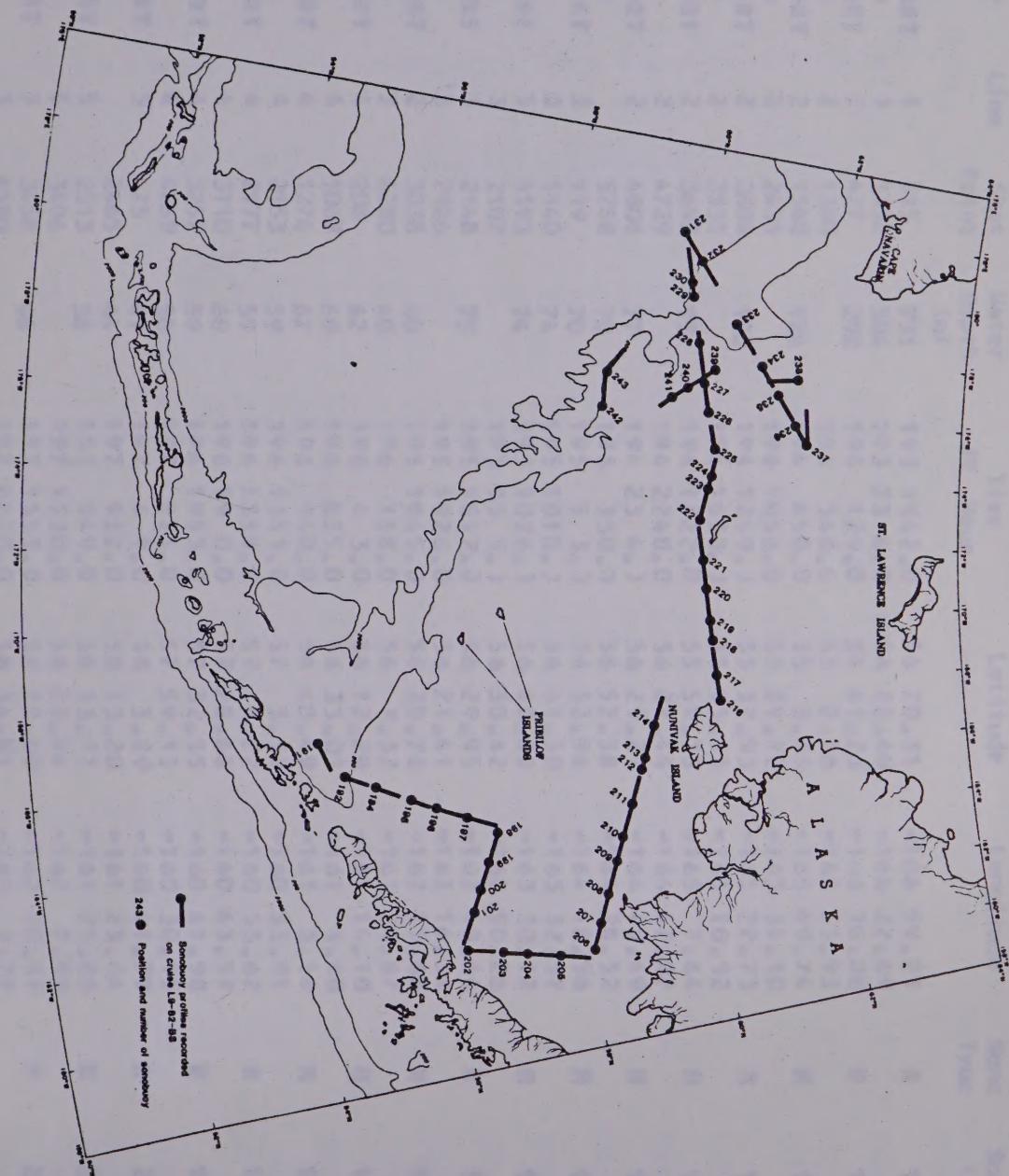


Figure 1 Index map of the Bering Sea showing location of sonobuoy profiles recorded in 1982 on cruise L9-82-BS.

Table 1: Sonobuoy Information

| Sonobuoy No. | Line | Shot Point | Water Depth (m) | Time JD Hour | Latitude | Longitude | Sono Type | Source (in3) |
|--------------|-------|------------|-----------------|--------------|------------|-----------|------------|--------------|
| 191 | START | 1 | 515 | 731 | 193 1842.0 | 56 20.51 | -166 59.21 | R 1311 |
| 191 | END | 1 | 1352 | 504 | 193 23.6.0 | 54 28.60 | -166 22.69 | R 1311 |
| 192 | START | 2 | 427 | 292 | 194 12.9.0 | 54 41.23 | -166 10.08 | R 1311 |
| 192 | END | 2 | 1340 | 194 | 54.8.0 | 55 2.76 | -165 53.93 | R 1311 |
| 194 | START | 2 | 1560 | 124 | 194 65.0.0 | 55 8.35 | -165 49.74 | R 1311 |
| 194 | END | 2 | 2435 | 194 | 1058.0 | 55 29.12 | -165 31.10 | R 1311 |
| 195 | START | 2 | 2808 | 110 | 194 1249.1 | 55 37.93 | -165 22.73 | R 1311 |
| 195 | END | 2 | 3535 | 194 | 1633.1 | 55 55.35 | -165 10.52 | R 1311 |
| 196 | START | 2 | 3692 | 95 | 194 1722.0 | 55 59.33 | -165 7.66 | R 1311 |
| 196 | END | 2 | 4729 | 194 | 2240.0 | 56 27.16 | -164 47.02 | R 1311 |
| 197 | START | 2 | 4808 | 77 | 194 23.4.1 | 56 29.21 | -164 45.49 | R 1311 |
| 197 | END | 2 | 5788 | 70 | 195 350.0 | 56 52.38 | -164 28.52 | R 1311 |
| 198 | START | 3 | 119 | 70 | 195 5.3.1 | 56 52.96 | -164 18.56 | R 1311 |
| 198 | END | 3 | 1140 | 74 | 195 1010.1 | 56 41.50 | -163 32.57 | R 1311 |
| 199 | START | 3 | 1193 | 74 | 195 1026.1 | 56 40.88 | -163 30.12 | R 1311 |
| 199 | END | 3 | 2107 | 195 | 15.5.1 | 56 30.42 | -162 50.26 | R 1311 |
| 200 | START | 3 | 2148 | 75 | 195 1517.0 | 56 29.95 | -162 48.66 | R 1311 |
| 200 | END | 3 | 2926 | 195 | 1926.0 | 56 21.61 | -162 16.34 | R 1311 |
| 201 | START | 2 | 3038 | 40 | 195 1945.0 | 56 20.78 | -162 13.86 | R 1311 |
| 201 | END | 3 | 4280 | 40 | 196 15.8.0 | 56 7.32 | -161 24.87 | R 1311 |
| 202 | START | 4 | 208 | 42 | 196 4.3.0 | 56 12.29 | -161 14.10 | R 1311 |
| 202 | END | 4 | 1067 | 69 | 196 835.0 | 56 35.01 | -161 5.40 | R 1311 |
| 203 | START | 4 | 1276 | 67 | 196 920.0 | 56 40.69 | -161 3.19 | R 1311 |
| 203 | END | 4 | 2153 | 59 | 196 1351.0 | 57 3.51 | -160 53.91 | R 1311 |
| 204 | START | 4 | 2177 | 59 | 196 1359.0 | 57 4.22 | -160 53.62 | R 1311 |
| 204 | END | 4 | 3110 | 60 | 196 19.0.0 | 57 28.66 | -160 43.57 | R 1311 |
| 205 | START | 4 | 3257 | 59 | 196 1953.0 | 57 32.55 | -160 41.98 | R 1311 |
| 205 | END | 4 | 4269 | 50 | 197 21.1.0 | 57 39.13 | -160 30.15 | R 1311 |
| 206 | START | 5 | 475 | 41 | 197 1553.0 | 58 3.89 | -160 41.79 | R 2300 |
| 206 | END | 5 | 2465 | 44 | 197 932.0 | 58 13.20 | -161 23.64 | R 2300 |
| 207 | START | 5 | 2513 | 38 | 197 949.0 | 58 13.71 | -161 25.85 | R 2300 |
| 207 | END | 5 | 3406 | 197 | 1530.0 | 58 22.84 | -162 7.95 | R 2300 |
| 208 | START | 5 | 3458 | 46 | 197 1553.0 | 58 23.60 | -162 10.57 | R 2300 |
| 208 | END | 5 | 4580 | 44 | 197 2220.0 | 58 34.81 | -163 3.77 | R 2300 |
| 209 | START | 5 | 4607 | 25 | 197 2230.0 | 58 35.07 | -163 5.13 | R 2300 |
| 209 | END | 5 | 5403 | 30 | 198 331.0 | 58 42.80 | -163 43.36 | R 2300 |
| 210 | START | 5 | 5463 | 29 | 198 352.0 | 58 43.37 | -163 46.31 | R 2300 |
| 210 | END | 5 | 6543 | 27 | 198 10.0.0 | 58 34.35 | -164 38.05 | R 2300 |

| Sonobuoy No. | Line | Shot Point | Water Depth (m) | JD Hour | Time | Latitude | Longitude | Sono Type | Source (in 3) |
|--------------|-------|------------|-----------------|---------|------------|----------|------------|-----------|---------------|
| 211 | START | 5 | 6593 | 27 | 198 1017.0 | 58 54.82 | -166 40.36 | R | 2100 |
| 211 | END | 5 | 7590 | 25 | 198 1632.0 | 59 4.51 | -165 28.28 | R | 2130 |
| 212 | START | 5 | 7704 | 25 | 198 1714.0 | 59 5.76 | -165 34.29 | M | 1900 |
| 213 | START | 5 | 8132 | 23 | 198 1926.0 | 59 9.94 | -165 55.10 | | |
| 212 | END | 5 | 8824 | 198 | 23 6.0 | 59 16.60 | -166 28.93 | | |
| 213 | END | 5 | 9163 | 26 | 199 116.0 | 59 19.68 | -166 45.77 | | |
| 214 | START | 5 | 9261 | 27 | 199 2 3.0 | 59 20.84 | -166 52.22 | R | 2100 |
| 214 | END | 5 | 10230 | 31 | 199 751.0 | 59 29.99 | -167 41.73 | | |
| 215 | START | 6 | 161 | 25 | 200 2231.0 | 60 21.60 | -167 22.10 | R | 1800 |
| 212 | END | 6 | 420 | 26 | 200 55.0 | 60 21.53 | -167 26.27 | | |
| 216 | START | 6 | 340 | 25 | 200 23 1.0 | 60 21.51 | -167 27.27 | M | 1800 |
| 216 | END | 6 | 1139 | 30 | 201 432.0 | 60 19.75 | -168 15.87 | | |
| 217 | START | 6 | 1210 | 31 | 201 457.0 | 60 19.62 | -168 19.85 | R | 2100 |
| 217 | END | 6 | 1987 | 39 | 201 930.0 | 60 17.02 | -169 7.76 | | |
| 218 | START | 6 | 2328 | 41 | 201 1010.0 | 60 16.76 | -169 15.35 | M | 2130 |
| 218 | END | 6 | 3328 | 54 | 201 15 0.0 | 60 15.50 | -170 8.82 | | |
| 219 | START | 7 | 127 | 50 | 202 7 7.0 | 60 16.06 | -169 53.12 | R | 2130 |
| 219 | END | 7 | 1123 | 64 | 202 1255.0 | 60 13.40 | -170 47.31 | | |
| 220 | START | 7 | 1199 | 64 | 202 1322.0 | 60 13.15 | -170 51.86 | M | 2100 |
| 220 | END | 7 | 2134 | 62 | 202 1830.0 | 60 10.05 | -171 42.51 | | |
| 221 | START | 7 | 2168 | 61 | 202 1840.0 | 60 9.94 | -171 44.17 | M | 1900 |
| 221 | END | 7 | 3262 | 58 | 203 045.0 | 60 5.84 | -172 42.30 | | |
| 222 | START | 8 | 127 | 127 | 203 142.0 | 60 6.73 | -172 51.43 | M | 1900 |
| 223 | START | 8 | 1292 | 87 | 203 9 8.0 | 60 16.30 | -173 52.64 | R | 1900 |
| 222 | END | 8 | 1450 | 203 | 10 0.0 | 60 15.21 | -174 0.91 | | |
| 223 | END | 8 | 2329 | 203 | 1119.0 | 60 16.82 | -174 14.00 | | |
| 224 | START | 8 | 1717 | 97 | 203 1125.0 | 60 16.94 | -174 15.00 | M | 1900 |
| 224 | END | 8 | 2329 | 203 | 1440.0 | 60 20.78 | -174 47.60 | | |
| 225 | START | 8 | 296 | 106 | 203 1625.0 | 60 19.38 | -175 4.36 | M | 1700 |
| 225 | END | 8 | 5620 | 203 | 2035.0 | 60 16.90 | -175 45.40 | | |
| 726 | START | 9 | 1570 | 128 | 203 2311.0 | 60 11.85 | -176 11.28 | M | 1311 |
| 726 | END | 9 | 2412 | 204 | 346.0 | 60 7.38 | -176 58.68 | | |
| 227 | START | 9 | 2453 | 135 | 204 358.0 | 60 7.10 | -177 0.83 | M | 1311 |
| 227 | END | 9 | 3657 | 142 | 204 10 0.0 | 60 0.59 | -178 1.52 | | |
| 228 | START | 9 | 3888 | 139 | 204 1110.0 | 59 59.37 | -178 13.23 | M | 1311 |
| 228 | END | 9 | 4180 | 204 | 1240.0 | 59 57.65 | -178 29.50 | | |
| 229 | START | 9 | 5401 | 2670 | 204 19 7.0 | 59 50.20 | -179 33.26 | M | 1311 |
| 229 | END | 9 | 2850 | 204 | 2222.0 | 59 47.16 | -179 57.73 | R | 1311 |
| START | | 9 | | | | | | | |

| Sonobuoy No. | Line | Shot Point | Water Depth (m) | Time JD Hour | Latitude | Longitude | Sono Type | Source (in3) | |
|--------------|-------|------------|-----------------|--------------|------------|------------|------------|--------------|------|
| 229 | END | 9 | 6160 | 204 2359.0 | 59 45.37 | 179 47.75 | R | 1311 | |
| 230 | END | 9 | 7043 | 205 445.0 | 59 40.16 | 179 2.23 | R | 1311 | |
| 231 | START | 10 | 50 | 205 10 3.0 | 59 35.34 | 178 33.69 | M | 1311 | |
| 231 | END | 10 | 1132 | 205 1618.0 | 59 53.06 | 179 19.50 | M | 1311 | |
| 232 | START | 10 | 1631 | 205 1631.0 | 59 53.70 | 179 21.20 | M | 1311 | |
| 232 | END | 10 | 2112 | 205 2131.0 | 60 8.81 | -179 58.25 | M | 1311 | |
| 233 | START | 10 | 3571 | 206 5 8.0 | 60 32.00 | -178 53.58 | M | 1311 | |
| 233 | END | 10 | 4727 | 206 1048.0 | 60 49.86 | -178 2.14 | R | 1311 | |
| 234 | START | 10 | 5200 | 206 1311.0 | 60 57.12 | -177 40.67 | R | 1311 | |
| 234 | END | 10 | 5988 | 206 1726.0 | 61 9.10 | -177 4.64 | R | 1311 | |
| 235 | START | 10 | 6278 | 206 19 0.0 | 61 13.37 | -176 51.13 | M | 1311 | |
| 235 | END | 10 | 7300 | 207 026.0 | 61 28.58 | -176 3.26 | M | 1311 | |
| 236 | START | 10 | 7370 | 207 048.0 | 61 29.56 | -176 0.02 | M | 1311 | |
| 236 | END | 10 | 8223 | 207 525.0 | 61 41.99 | -175 19.53 | M | 1311 | |
| 237 | START | 11 | 43 | 80 | 207 821.0 | 61 42.06 | -175 16.81 | M | 1311 |
| 237 | END | 11 | 1291 | 207 1440.0 | 61 40.04 | -176 27.26 | R | 1700 | |
| 238 | START | 12 | 247 | 100 | 207 21 9.0 | 61 30.67 | -177 23.07 | R | 1700 |
| 238 | END | 12 | 1275 | 208 238.0 | 61 3.58 | -177 14.51 | M | 1700 | |
| 239 | START | 14 | 67 | 139 | 208 1227.0 | 60 15.45 | -177 27.67 | M | 1700 |
| 240 | START | 14 | 550 | 137 | 208 1511.0 | 60 4.57 | -177 11.81 | R | 1700 |
| 239 | END | 14 | 1142 | 136 | 208 1831.0 | 59 51.71 | -176 52.74 | M | 2000 |
| 241 | START | 14 | 1153 | 136 | 208 1834.0 | 59 51.55 | -176 52.44 | M | 1400 |
| 240 | END | 14 | 1805 | 136 | 208 22 7.0 | 59 39.07 | -176 33.02 | M | 2000 |
| 241 | END | 14 | 2234 | 135 | 209 1 0.0 | 59 28.43 | -176 17.60 | R | 2000 |
| 242 | START | 28 | 43 | 152 | 213 545.0 | 58 37.94 | -176 10.90 | M,R | 2000 |
| 242 | END | 28 | 590 | 142 | 213 11 0.0 | 58 38.99 | -177 8.50 | M | 2000 |
| 243 | START | 29 | 42 | 142 | 213 1112.0 | 58 39.32 | -177 10.68 | R | 2000 |
| 243 | END | 29 | 499 | 213 1530.0 | 58 52.11 | -177 51.60 | R | 2000 | |

M = Military sonobuoy - U.S. Navy type 41B

R = Commercial sonobuoy - REF TEK 1

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